

**DEVICE FOR SECURING A SEALING MEMBER
IN A PREDETERMINED POSITION**

FIELD OF INVENTION

The present invention relates, in general, to a pressure
5 release valve, and more particularly, to a device for securing a
sealing member in a pressure release valve.

BACKGROUND OF THE INVENTION

10 Prior to the present invention, o-rings in a standard
packed-bore type pressure release valve with a high pressure
port and a low pressure port are disposed about a recess created
between the flanges of two adjacent spool valve shells. During
slow cycling of the valve while under high pressure, o-rings can
become dislodged from the recess, causing operational problems.
15 Viton™ material is typically used because it has a greater
stiffness in order to prevent the o-rings from dislodging from
the high pressure during valve actuation. However, at -40°F,
functional testing has revealed that a Viton™ o-ring does not
provide a leak-proof seal. To correct the problem, the Viton™
o-ring was replaced with a nitrile o-ring of the same size.
20 Because it is softer than Viton™, the nitrile material provides
a leak-proof seal. However, functional testing of the valve
with the nitrile o-rings revealed that when the valve is
actuated, the resultant high pressure might dislodge the nitrile

o-ring, causing interference with the normal operation of the valve.

When the rate of actuation of the valve increases, o-ring dislodgement is minimized. However, depending on the particular application, a high rate of actuation may not always be possible with a valve that relies on a pressure differential method of operation. While the greater stiffness of the Viton™ o-rings eliminates the dislodgement problem, the operational range and performance of the valve is adversely affected as a result.

SUMMARY OF THE INVENTION

In a first aspect, the present invention provides a device for securing an o-ring in a predetermined position. The device comprises a positioning element of a predetermined size and shape having a first surface and a second surface. A retaining element of a predetermined size and shape is disposed on at least one of the first surface and the second surface of the positioning element.

In a further aspect, the present invention provides for a device for securing a plurality of sealing members in a predetermined position. The device comprises two positioning elements of a predetermined size and shape having a first surface and a second surface. Two retaining elements of a predetermined size and shape are disposed on the first surface of the positioning elements. A spacer means of a predetermined

size and shape locates the positioning elements a predetermined position from each other.

In still a further aspect, the present invention provides a device in combination with a pressure release valve having a high pressure port, a low pressure port, a spool valve, check valve, and a reset spool. The spool valve, check valve, and reset spool further have a plurality of spool valve shells. The improvement comprises the spool valve shell having two positioning elements of a predetermined size and shape. Two retaining elements of a predetermined size and shape are disposed on the positioning elements. A spacer means of a predetermined size and shape locate the positioning elements a predetermined distance from each other. A sealing member of a predetermined size and shape is disposed intermediate two opposing positioning elements of two adjacent spool valve shells. The retaining elements on the opposing positioning elements secure the sealing member in position when the pressure release valve is actuated.

OBJECTS OF THE INVENTION

It is therefore the primary object of the present invention to provide a device for restricting the dislodgement of the o-ring in a pressure release valve.

Another object of the present invention is to provide the potential for utilizing various o-ring materials than can

ultimately provide improved sealing characteristics and superior valve performance.

Another object of the present invention is to provide a spool valve shell configuration that is interchangeable with the standard design with minimal or no modifications to the valve.

In addition to the various objects of the invention that have been described above, various other objects and advantages of the invention will become more readily apparent to those persons skilled in the relevant art from the following more detailed description of the invention, particularly, when such description is taken in conjunction with the attached drawing figures and the appended claims.

BRIEF DESCRIPTION OF THE DRAWINGS

Figure 1 is a front view of the device for securing a sealing member in a predetermined position;

Figure 2 is a vertical section view taken along the lines II-II of Figure 1;

Figure 3 is a detailed view taken from the encircled area III of Figure 2;

Figure 4 is a vertical view of the device for securing a plurality of sealing members in a predetermined position; and

Figure 5 is a vertical sectional view of a typical pressure release valve incorporating the improvement for securing a plurality of sealing members in a predetermined position.

BRIEF DESCRIPTION OF A PRESENTLY
PREFERRED AND VARIOUS ALTERNATIVE
EMBODIMENTS OF THE PRESENT INVENTION

Prior to proceeding to a more detailed description of the
invention, it should be noted that identical components having
identical functions have been designated with identical
reference numerals for the sake of clarity.

Now refer more particularly to Figures 1, 2, and 3 of the
drawings. Illustrated therein is a device for securing a
sealing member in a predetermined position, generally
designated 1. The device comprises a positioning element 10 of
a predetermined size and shape. The positioning element 10 has
a first surface 11 and a second surface 12. A retaining
element 20 is disposed on at least one of the first surface 11
and the second surface 12 of the positioning element 10. The
positioning element 10 is an annulus having an inside
diameter 13 and an outside diameter 14. The retaining element
is an annulus having an inside diameter 21 and an outside
diameter 22. Preferably, the positioning element 10 and the
retaining element 20 are integrally formed, and the retaining
element 20 is disposed on the first surface 11 of the
positioning element 10. The inside diameter 21 of the retaining
element 20 is substantially equal to the inside diameter 13 of
the positioning element 10. The outside diameter 22 of the
retaining element 20 is smaller than the outside diameter 14 of

the positioning element 10. Preferably, the outside diameter 22 of the retaining element 20 has a bevel 23 with a first end 24 and a second end 25. A radius 26 of a predetermined size is disposed tangent to the first surface 11 of the positioning
5 element 10 and the first end 24 of the bevel 23 of the retaining element 20.

Now refer more particularly to Figures 1, 3 and 4 of the drawings. Illustrated therein is a device for securing a plurality of sealing members in a predetermined position, generally designated 30. The device comprises two positioning elements 10 of a predetermined size and shape having a first surface 11 and a second surface 12. Two retaining elements 20 of a predetermined size and shape are disposed on the first surface 11 of the positioning elements 10. A spacer means 40 of a predetermined size and shape locates the positioning elements 10 a predetermined distance from each other. Preferably, the spacer means 40 is a plurality of four posts of a predetermined length disposed intermediate the positioning elements 10. The positioning elements 10 are annular shaped
20 having an inside diameter 13 and an outside diameter 14. The retaining elements are annular shaped having an inside diameter 21 and an outside diameter 22. Preferably, the positioning elements 10 and the retaining elements 20 are integrally formed with the spacer means 40. The inside

diameter 21 of the retaining elements 20 is substantially equal to the inside diameter 13 of the positioning elements 10. The outside diameter 22 of the retaining elements 20 is smaller than the outside diameter 14 of the positioning elements 10. Preferably, the outside diameter 22 of the retaining elements 20 has a bevel 23 with a first end 24 and a second end 25. A radius 26 of a predetermined size is disposed tangent to the first surface 11 of the positioning elements 10 and the first end 24 of the bevel 23 of the retaining elements 20.

Now refer more particularly to Figures 3, 4, and 5 of the drawings. Illustrated therein is an improvement in combination with a pressure release valve generally designated 50, having a high pressure port 51, a low pressure port 52, and a spool valve, generally designated 53. The spool valve further has a plurality of spool valve shells, generally designated 30. The improvement comprises the spool valve shells 30 having two positioning elements 10 of a predetermined size and shape, two retaining elements 20 of a predetermined size and shape disposed on the positioning elements 10, a spacer means 40 of a predetermined size and shape for locating the positioning elements 10 a predetermined distance from each other, and a sealing member 55 of a predetermined size and shape disposed intermediate two opposing positioning elements 10 of two adjacent spool valve shells 30. The retaining elements 20 on

the opposing positioning elements 10 secure the sealing member 55 in position when the pressure release valve 50 is actuated. The positioning elements 10 have an inside diameter 13 and an outside diameter 14. The retaining elements 5 have an inside diameter 21 and an outside diameter 22. Preferably, the positioning elements 10 and the retaining elements 20 are integrally formed with the spacer means 40. The inside diameter 21 of the retaining elements 20 is substantially equal to the inside diameter 13 of the positioning elements 10. The outside diameter 22 of the retaining elements 20 is smaller than the outside diameter 14 of the positioning elements 10. Preferably, the outside diameter 22 of the retaining elements 20 has a bevel 23 with a first end 24 and a second end 25. A radius 26 of a predetermined size is disposed tangent to the first surface 11 of the positioning elements 10 and the first end 24 of the bevel 23 of the retaining elements 20. Preferably, the spacer means 40 is a plurality of four posts disposed intermediate the positioning elements 10. The preferred shape of the sealing member 55 is an o-ring. The 20 preferred material of the sealing member 55 is nitrile.

Although the invention has been shown in connection with a certain specific embodiment, it will be readily apparent to those skilled in the art that various changes in form and

arrangement of parts may be made to suit requirements without departing from the spirit and scope of the invention.